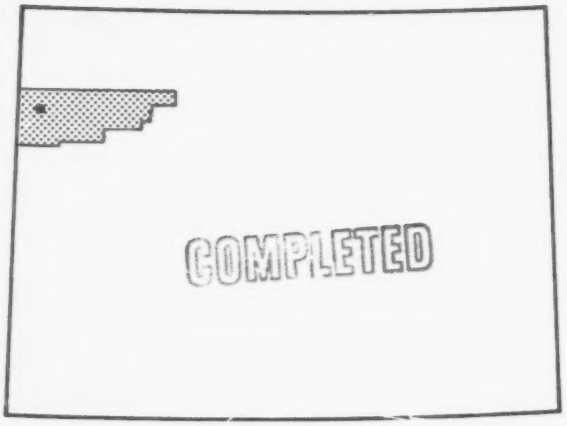
FLOOD INSURANCE STUDY

TOWN OF RANGELY, COLORADO
RIO BLANCO COUNTY



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Federal Emergency Management Agency

COMMUNITY NUMBER - 080152

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study may not contain all the data available within the repository. Please contact the community repository for any additional data.

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FLOOD INSURANCE STUDY
TOWN OF RANGELY, RIO BLANCO COUNTY, COLORADO

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study revises and updates a previous Flood Insurance Study/Flood Insurance Rate Map for the Town of Rangely, Rio Blanco County, Colorado, published September 27, 1985 (Reference 1). This information will be used by the Town of Rangely to update existing floodplain regulations as part of the Regular Phase of the National Flood Insurance Program (NFIP). The information will also be used by local and regional planners to further promote sound land use and floodplain development.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the State (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for the original study for Rio Blanco County were performed by Simons, Li & Associates, Inc., for the Federal Emergency Management Agency (FEMA), under Contract No. EMW-C-0942. This study was completed in December 1983.

1.3 Coordination

Streams requiring detailed study were identified at an initial meeting attended by representatives of the study contractor, FEMA, and the Town of Rangely, in June 1982.

Results of the hydrologic analyses were coordinated with the U.S. Army Corps of Engineers (COE), Colorado Water Conservation Board, Claycomb Engineers, and the U.S. Geological Survey (USGS).

In January 1984, the results of the study were reviewed at an intermediate coordination meeting attended by representatives of the study contractor, FEMA, and the Town of Rangely. No significant changes were made as the result of that meeting.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated areas of the Town of Rangely, Rio Blanco County, Colorado. The area of study is shown on the Vicinity Map (Figure 1).

Flooding caused by the overflow of the White River, College Canyon Draw, and Coal Mine Draw was studied in detail within the Town of Rangely.

The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development or proposed construction.

Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to, and agreed upon by, FEMA and the Town of Rangely.

2.2 Community Description

The Town of Rangely is located in the northwestern corner of Rio Blanco County, approximately 18 miles east of the Colorado-Utah State line and 57 miles west of Meeker, the only other sizable community in the county. Rangely is situated at an elevation of 5,200 feet and is approximately 70 miles north of Grand Junction, Colorado, 180 miles east of Salt Lake City, and 200 miles west of Denver.

Rangely was originally settled in 1882 as a center for cattle ranching and Indian trading. The area was virtually unknown until 1947 when a major oil discovery was made. Ultimately, the Rangely Oilfield became the largest producer in the Rocky Mountain region and the sixth largest in the United States.

Rangely is not on any main transportation routes, but it is connected to both Meeker and Dinosaur, Colorado, via Colorado State Highway 64. Transportation facilities have generally been adequate to meet the needs of the farm and ranch population. Because there is no railroad line through Rangely, most livestock are shipped to market by truck. The county airport near Rangely has a 6,700-foot lighted runway and can accommodate light commercial aircraft.

Characteristic vegetation in the Rangely area is determined by moisture, exposure, temperature, and elevation. In the immediate environs, which are best defined as desert rangeland, the vegetation includes saltbush, shadscale, bud sage, and hardy grasses. In the foothill regions, cover is predominantly comprised of big sagebrush with an understory of grasses. Aspen, spruce, and fir are characteristic farther up-slope, and arctic varieties of willow, sedge, and clover are found above timberline.

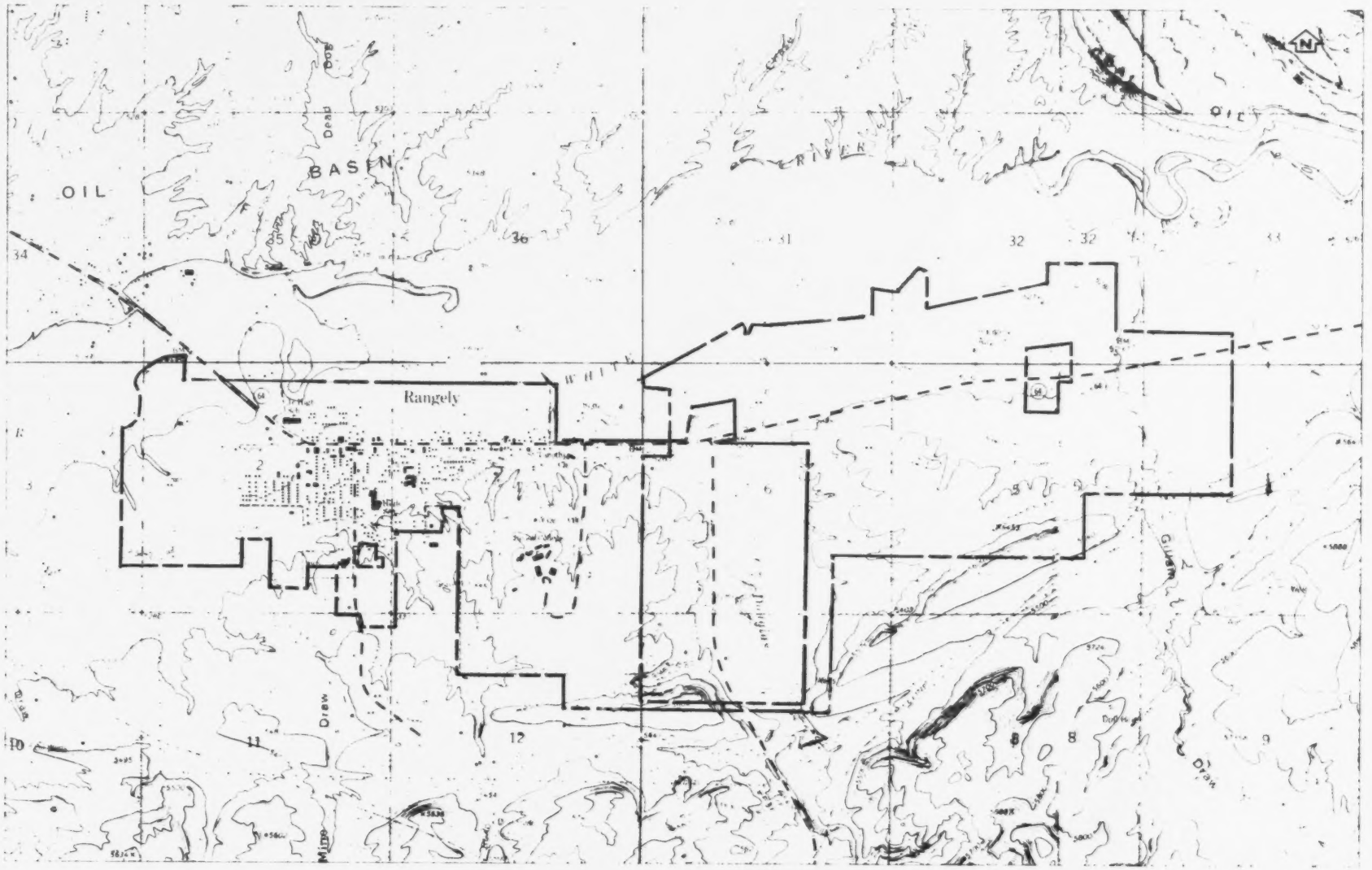


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF RANGELY, CO
(RIO BLANCO CO.)

APPROXIMATE SCALE

3000 0 3000 6000 9000 FEET

VICINITY MAP

In general, the drainage pattern of Rangely is from southeast to northwest. The White River flows westward on a meandering course just north of Rangely. The drainage basin of College Canyon Draw, also known as Dragon Wash, is south of the town. The stream enters the town along its southern corporate limits, flowing west and northwest to join the White River. The drainage basin of Coal Mine Draw is also south of town and is situated directly to the west of the College Canyon Draw drainage basin. The stream enters the town in the western half of its southern corporate limits, then flows west and northwest to its confluence with the White River.

Rangely rests on a bedrock formation of Mancos Shale of the Upper Cretaceous age. This layer is more than 5,000 feet thick, and is essentially a dark grey, calcareous, marine deposit that weathers light grey to yellow brown. Selenite gypsum is common throughout the formation. The soils of this area have formed under a low-effective annual precipitation. Soil-parent materials are mainly calcareous, clayish shales and sandstones; however, sandy and gravelly outwash, windblown sands and silts, and alluvial sediments are also extensive. Surface soils are light colored and range in texture from sandy loam to silty clay. Subsoils are principally clay loam or clay in texture, and have a permeability rate that varies from moderate to slow. Sandy subsoils with a high permeability rate are a minor component within the area.

Tourism is of little significance to the town, even though Dinosaur National Park is only 30 miles to the north. Available lodging in Rangely is limited to that required for oilfield workers. However, the town is growing. Based on 1970 and 1980 Bureau of Census population figures of 1,591 and 2,113, respectively, Rangely experienced a 33-percent population growth in 10 years. Today, Rangely has a population of approximately 2,530, according to a survey conducted by the Town of Rangely Department of Community Development (Reference 2).

Oil has been the lifeblood of the town, but cattle and sheep ranching is also considered important to the economy of this rural community. The town is looking forward to further coal and oil development. Other natural resources in the Rangely area include rare earths, copper, silver, gold, thorium, aluminum, low-grade uranium, and high-grade oil shale (estimated to contain more than 1.5 trillion barrels of oil). Oil shale development holds many possibilities for social and economic growth. Although large scale plans for oil shale development have already been made, implementation has presently been suspended until economic conditions change.

Topography in the Rangely area is extremely diverse, and includes dissected plateaus, sharp ridges, abrupt cliffs, and rugged badlands that are interspersed with open valleys, meadows, and basins. The presence of underlying rock layers with wide differences in resistance to erosion has been the principal factor in the evolution of these varied landforms. Erosion in the rolling shale hills and badlands around Rangely is severe. Deep and

extensive gullying along drainageways and narrow valleys is of considerable agricultural significance. In many locations, dissection by gullies severely limits use of the land, and bridging gullies increases highway construction costs.

Climate in the Rangely area is classified as semiarid, with relatively warm summers and cold winters. The mean annual temperature is 46°F, with extremes of -37°F and 106°F. The lower valley of the White River near Rangely has a frost-free period with an average length of 124 days per year. Average annual precipitation varies from 50 inches in the headwater regions of the White River Basin to 9.3 inches at Rangely. Normally, approximately 40 percent of the annual precipitation occurs during August, September, and October. Wintertime precipitation occurs as snow, and a deep snowpack usually accumulates in the high elevations. The average annual snowfall is 22.3 inches (Reference 2). Summer rainstorms cause short-duration runoff that is characterized by high peak, low-volume flows.

The floodplains of the streams studied are presently not extensively developed. There are various transportation facilities in the floodplains. There are some industrial and light residential land uses. However, continued and probably accelerated development due to increasing emphasis on mineral and energy extracting and processing is expected, and pressure leading to intensified floodplain use will undoubtedly accompany such development.

2.3 Principal Flood Problems

Because of its particular geographic location, Rangely is subject to five different types of events that cause flooding: ice jams, rapid snowmelt, rain on snow, general rain, and local thunderstorms. The low permeability of the soils in and around Rangely is also a factor in producing flooding in the study area. Historically, ice jams, rain on snow, and local thunderstorms have caused the greatest flood damage in and around Rangely. Ice jams are formed by ice flows piling up at an obstacle, such as an existing ice accumulation, bridge, or streambed irregularity. The ice blocks the entire channel section completely down to the river bottom, and water then has to move through the ice plug by infiltration. When infiltration is inadequate, the water-surface elevation increases until spill occurs and adjacent land is flooded. However, ice jams are unstable and often break up when the upstream water level increases. Ice jams are usually caused by Chinook winds and temperature inversions. During a Chinook, air temperature may increase very rapidly (increases of more than 50°F in a few hours have been recorded in some areas subject to these winds), and it is not unusual for a 2-foot layer of snow to melt in 1 day. Temperature inversions cause ice jams by melting upper elevation snow and ice, while freezing conditions remain in the lower elevations. The rising water heaves and breaks up river ice, which floats into jams.

Twice in the last 85 years, in March 1955 and February 1962, ice jams caused water stages in the White River to reach Main Street between Colorow Street and Birch Avenue. These floods caused damage to homes, businesses, and public utilities. Ice jam floods have been observed as far back as 1891, when Rangely consisted of a saloon, blacksmith shop, store, and hotel.

In the late summer of 1910 or 1911, a thunderstorm produced flood stages almost to the 1962 level. Another thunderstorm in the 1920s raised the White River to approximately the location of the Rangely Hotel, but the water was 1 foot lower than the 1955 flood.

Two of the largest thunderstorms to produce local flooding occurred in August 1946 and July 1953. In the 1946 flood, one downtown office building had from 6 to 8 inches of water covering the floor. On July 31, 1953, 1.42 inches of rain was measured in slightly over 1 hour at the Rangely gage, and resultant local flooding washed out a road and tore away a bridge outside of Rangely. In town, runoff caused drainage ditches to overflow, and damage from the floodwaters was aggravated when the high water picked up oily mud from around a local oil well.

Less than 2 years later, in March 1955, an ice jam in the White River caused the river to leave its banks, and at one time the town water supply was cut off when 6 feet of floodwater covered the water filtration plant.

Water supply was again interrupted by ice jams above and below the town in February 1962. The flood of February 1962 was the largest flood of record. In March 1966, another ice jam diverted the flow of the White River and several ranches experienced flooding. Most recently, flooding as a result of an ice jam occurred in March 1983.

Local residents agree that damaging floods occur on the average of once every 7 to 10 years, with the majority resulting from ice jams. Shallow flooding, with water characteristically less than 3 feet deep, occasionally occurs in some southern portions of Rangely as a result of rampant thunderstorm runoff from ravines and washes.

Due to a lack of streamflow records for the immediate vicinity of Rangely, data basic to estimating the frequency of past floods are not available.

2.4 Flood Protection Measures

There are no Federal flood control projects affording protection to Rangely, and none are under consideration. Most new development in Rangely is being kept out of potential flood damage areas.

College Canyon Draw has been channelized between South White Avenue and County Highway 2 to increase channel capacity.

A dam has been constructed on the White River at the Taylor Draw Reservoir approximately 7 miles upstream of the Town of Rangely. The reservoir was not constructed for flood protection purposes. The reservoir storage volume is 13,800 acre-feet, as compared with an average annual runoff of 550,000 acre-feet for the approximately 3,000 square mile drainage area, and has no significant affect on the 100- and 500-year floods. Construction of the dam was completed in the spring of 1984. Though not intended to provide flood protection, it is expected that the dam will indirectly serve to lessen or eliminate flooding problems caused by ice jams in the town. It is believed the dam will provide flood protection since it will collect ice flows and fluctuate discharges in the river, causing existing ice accumulations to break up and thus preventing blockages.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1-percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish peak discharge-frequency relationships for floods of the selected recurrence intervals for each flooding source studied by detailed methods affecting the community.

Peak floodflows on the White River were computed from a statistical analysis of 73 years of gaged data. A log-Pearson Type III frequency distribution was used in the analysis and three sets of discharges were computed from a station skew, a regional skew, and a weighted skew coefficient. For further comparisons, a set of discharges was computed from a Gumbel extreme value distribution and Hazen plotting positions for the 66-year period of record from

1910 to 1976. Separation of the gaged data into snowmelt and rainfall categories was not considered.

Several forms of regional comparisons were made as an aid in evaluating and interpreting the statistical flood frequency analysis. These include flood discharges calculated from regional multiple regression equations (TM-1, Reference 3), the index flood method (WSP 1683, Reference 4), and comparisons with runoff (CSM) ratios for adopted 100-yea frequency flood discharges in northwest Colorado.

The hydrologic analysis for the White River near Rangely was based on annual peak flow data for snowmelt and rainfall floods. Annual peak flows for rainfall and snowmelt floods have been published by the USGS (Reference 5). Additional annual peak flows, for rainfall and snowmelt floods were obtained from inspection of the USGS strip charts. Frequency analyses were made on both peak flow data sets.

The two frequency curves were assumed to represent independent events and a composite flow-frequency curve was developed for each gaging station. A regional regression analysis was then made to determine peak flow as a function of drainage area and return period (Reference 6). Flow data on the White River were based on the following USGS stream gages:

Gage	Gage Number	Years of Record
White River near Watson, Utah	09306500	51
White River near Rangely, Colorado	09306300	8
White River near Meeker, Colorado	09304800	70

For the ungaged streams, Coal Mine Draw and College Canyon Draw, peak flows were adopted from the hydrology analyses previously conducted in the development of a storm-drainage master plan for the Town of Rangely (Reference 7). College Canyon Draw and Coal Mine Draw have drainage areas of 1.8 and 2.9 square miles, respectively, and are below 6,000 feet. Rainfall events generate flood peaks for small basins below elevation 6,000 feet. The U.S. Soil Conservation Service method (Reference 8) was used to generate hydrographs based on regional parameters.

Peak discharge-drainage area relationships for the streams studied in detail are shown in Table 1.

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

The water-surface elevations for the streams studied were computed through use of the COE HEC-2 step-backwater computer program (Reference 9).

Table 1. Summary of Discharges

Flooding Source and Location	Drainage Area (square miles)	Peak Discharges (cubic feet per second) 10-Year	50-Year	100-Year	500-Year
White River					
Downstream of Confluence of Coal Mine Draw	3,300	7,500	13,500	20,000	35,000
Upstream of Confluence of Douglas Creek	2,880	7,000	13,000	18,500	33,000
Coal Mine Draw					
At Mouth	2.9	290	690	830	1,200
Above County Highway 2	2.1	220	520	630	920
College Canyon Draw					
At Mouth	1.8	185[1]	210[1]	230[1]	240[1]
Above South White Avenue	1.5	200	460	560	1,000

[1]Reduction in discharge is due to overflow losses that occur at South White Avenue and Prospect Street

Cross sections for backwater analyses were digitized from 1982 aerial photography (Reference 10). Since the cross sections for the White River did not include any below-water geometry, adjusted discharge values were used in the HEC-2 analyses for that stream. The adjusted discharge values were determined by reducing the peak discharges, as shown in Table 1, by the flow in the White River at the time of the aerial photography. The flow in the river at the time of the photography was obtained from records at the USGS gaging station No. 09306300.

The State Highway 64 and South White Avenue bridges over the White River and all culverts along College Canyon Draw and Coal Mine Draw were field surveyed to obtain elevation data and structural geometry.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway is computed (Section 4.2), selected cross section locations are also shown on the Flood Insurance Rate Map (Exhibit 2).

Roughness coefficients (Manning's "n") were determined by field observation. The coefficients used were 0.040 for the main channel and 0.060 for the overbank areas on the White River, and 0.040 for both the mainstream and overbank areas of Coal Mine Draw. Roughness coefficients for the main channel and overbank areas of College Canyon Draw varied from 0.040 to 0.045. A slope area normal-depth computation was used to determine starting water-surface elevations for all floods.

The effect of ice jams on flood hazards within Rangely were not reflected in the hydraulic analyses for this study.

Two culverts at street crossings along College Canyon Draw limit the stream carrying capacity. Limited culvert capacity at South White Avenue causes 50-, 100-, and 500-year flows to escape the channel along the right overbank. These flows result in shallow flooding extending north along South White Avenue and east along East Main Street. Limited culvert capacity at Prospect Street causes 10-, 50-, 100-, and 500-year flows to escape the channel along the right overbank and to flow north to the White River.

Normal-depth analyses were used to determine the depth of flooding resulting from the overflows from College Canyon Draw. The shallow 100-year overflows occurring at South White Avenue and Prospect Street were determined to have depths averaging less than 1.0 foot.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum (NGVD) of 1929. Elevation reference marks used in the study

are shown on the maps; the descriptions of the marks are presented in Elevation Reference Marks (Exhibit 3).

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100- and 500-year floodplain boundaries and 100-year floodway to assist communities in developing sound floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the 100- and 500-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:1,200 and 1:2,400, with a contour interval of 2 feet (References 11 and 12).

Shallow flooding boundaries were delineated using topographic maps at a scale of 1:1,200, with a contour interval of 2 feet (Reference 11), and using methods described in Section 3.2.

The 100- and 500-year floodplain boundaries are shown on the Flood Insurance Rate Map (Exhibit 2). On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A and AE), and the 500-year floodplain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 100- and 500-year floodplain boundaries are close together, only the 100-year floodplain boundary has been shown. Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the streams studied by approximate methods, only the 100-year floodplain boundary is shown on the Flood Insurance Rate Map (Exhibit 2).

4.2 Floodways

Encroachment on floodplains, such as structures and fill, reduces the flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of floodplain management involves balancing the economic gain from floodplain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this

aspect of floodplain management. Under this concept, the area of the 100-year floodplain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent floodplain areas, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum FEMA standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this report are presented to local agencies as minimum standards that can be adopted or that can be used as a basis for additional studies.

The floodways presented in this study were computed on the basis of equal-conveyance reduction from each side of the floodplain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of these computations are tabulated at selected cross sections (Table 2). In cases where the floodway and 100-year floodplain boundaries are either close together or collinear, only the floodway boundary has been shown.

The area between the floodway and the 100-year floodplain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the floodplain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to floodplain development are shown in Figure 2.

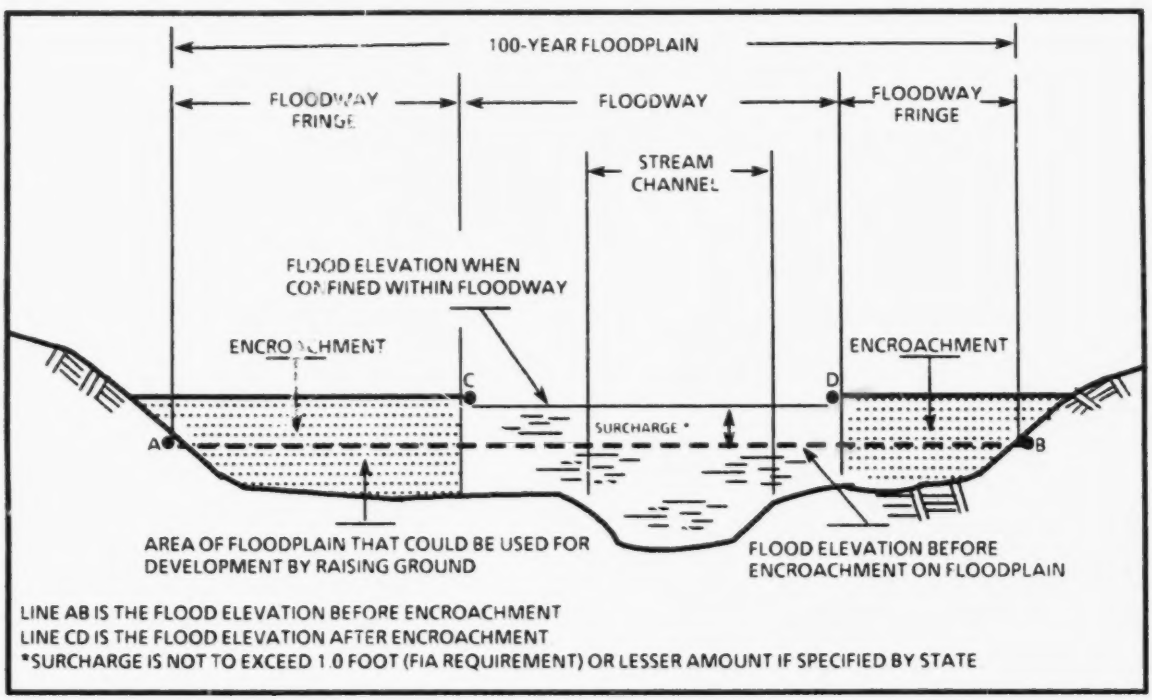

100-YEAR FLOODPLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
A
B
SURCHARGE *
AREA OF FLOODPLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOODPLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FIA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE

Figure 2. Floodway Schematic

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
White River								
A	1,020	931/80[2]	4,629	3.8	5,192.5	5,192.5	5,193.5	1.0
B	2,170	1,049/1,000[2]	6,013	2.9	5,194.1	5,194.1	5,194.9	0.8
C	2,730	932/590[2]	4,635	3.8	5,194.6	5,194.6	5,195.6	1.0
D	3,300	185[3]	1,452	12.2	5,196.0	5,196.0	5,196.4	0.4
E	3,346	185[3]	1,877	9.4	5,198.8	5,198.8	5,198.8	0.0
F	4,506	708[3]	6,526	2.7	5,200.8	5,200.8	5,201.3	0.5
G	5,296	761[3]	5,455	3.2	5,200.9	5,200.9	5,201.5	0.6
H	5,696	798[3]	6,154	2.9	5,201.1	5,201.1	5,201.9	0.8
I	6,136	711[3]	5,019	3.5	5,201.3	5,201.3	5,202.2	0.9
J	6,536	815[3]	5,211	3.4	5,201.8	5,201.8	5,202.7	0.9
K	7,021	2,495[3]	5,909	3.0	5,204.6	5,204.6	5,205.5	0.9
L	7,951	1,062[3]	6,524	2.7	5,205.6	5,205.6	5,206.1	0.5
M	8,901	1,059[3]	4,787	3.7	5,206.1	5,206.1	5,207.0	0.9
N	9,551	1,076[3]	3,807	4.6	5,207.6	5,207.6	5,208.0	0.4
O	10,091	1,176[3]	5,546	3.2	5,209.1	5,209.1	5,209.5	0.4
P	11,991	1,231[3]	5,645	3.1	5,210.3	5,210.3	5,211.3	1.0
Q	13,311	1,216[3]	5,955	3.0	5,211.7	5,211.7	5,212.7	1.0
R	15,311	1,427[3]	6,585	2.7	5,213.0	5,213.0	5,213.8	0.8
S	17,231	1,342/272[2]	5,106	3.5	5,214.1	5,214.1	5,215.0	0.9
T	18,001	1,270[3]	3,816	4.6	5,215.7	5,215.7	5,216.2	0.5
U	21,841	1,155/395[2]	6,158	2.6	5,221.4	5,221.4	5,222.3	0.9
V	22,871	1,075[3]	4,138	3.9	5,222.5	5,222.5	5,223.3	0.8
W	32,041	2,206[3]	1,287	12.6	5,237.2	5,237.2	5,237.2	0.0
X	32,621	1,476[3]	9,368	1.7	5,239.3	5,239.3	5,240.3	1.0

[1]Feet Above Confluence of Coal Mine Draw
[2]Width/Width Within Corporate Limits
[3]Lies Entirely Outside Corporate Limits

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF RANGELY, CO
(RIO BLANCO CO.)

FLOODWAY DATA

WHITE RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Coal Mine Draw								
A	1,105	37	123	6.8	5,198.5	5,198.5	5,199.2	0.7
B	1,605	28	92	9.1	5,202.9	5,202.9	5,203.2	0.3
C	2,475	26	106	7.9	5,212.3	5,212.3	5,212.7	0.4
D	3,360	22	82	10.2	5,224.9	5,224.9	5,224.9	0.0
E	3,450	501	185	3.4	5,243.4	5,243.4	5,243.4	0.0
F	3,473	533	316	2.0	5,243.7	5,243.7	5,243.7	0.0
G	3,570	30	354	2.3	5,243.7	5,243.7	5,243.7	0.0
College Canyon Draw								
A	0	27	68	3.8	5,192.2	5,187.6[2]	5,188.6[2]	1.0
B	215	112	60	4.2	5,192.5	5,192.5	5,192.5	0.0
C	235	58	48	5.2	5,193.5	5,193.5	5,193.6	0.1
D	310	22	36	7.3	5,195.6	5,195.6	5,195.7	0.1
E	590	28	68	3.8	5,198.8	5,198.8	5,199.0	0.2
F	1,560	17	33	8.0	5,213.6	5,213.6	5,213.7	0.1
G	1,630	4	21	12.4	5,216.2	5,216.2	5,216.6	0.4
H	1,700	27	190	2.0	5,220.8	5,220.8	5,221.8	1.0
I	2,335	22	83	5.7	5,223.0	5,223.0	5,223.2	0.2
J	2,875	17	52	9.0	5,227.0	5,227.0	5,227.1	0.1
K	3,285	25	91	5.2	5,231.1	5,231.1	5,231.3	0.2
L	3,345	14	77	6.1	5,231.1	5,231.1	5,231.3	0.2
M	3,400	20	91	5.2	5,231.5	5,231.5	5,231.7	0.2
N	4,160	27	81	5.8	5,240.0	5,240.0	5,240.1	0.1
O	4,560	24	65	7.2	5,243.2	5,243.2	5,243.3	0.1
P	4,610	20	60	7.8	5,243.5	5,243.5	5,243.6	0.1

[1]Feet Above Mouth
[2]Elevation Computed Without Consideration of Backwater From the White River

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF RANGELY, CO
(RIO BLANCO CO.)

FLOODWAY DATA

COAL MINE DRAW - COLLEGE CANYON DRAW

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
College Canyon Draw (Cont'd)								
Q	4,730	28	106	4.4	5,245.5	5,245.5	5,245.7	0.2
R	4,770	22	53	8.9	5,246.5	5,246.5	5,246.6	0.1
S	5,290	32	93	5.1	5,251.4	5,251.4	2,251.5	0.1
T	5,740	20	52	9.0	5,255.4	5,255.4	5,255.5	0.1
U	5,790	7	33	12.7	5,256.8	5,256.8	5,257.0	0.2
V	5,857	7	50	8.5	5,258.9	5,258.9	5,259.6	0.7
W	5,897	52	260	1.7	5,260.9	5,260.9	5,261.4	0.5
X	6,127	27	101	5.5	5,260.9	5,260.9	5,261.4	0.5
Y	6,407	11	49	11.3	5,263.3	5,263.3	5,263.8	0.5
Z	9,422	19	57	9.9	5,314.0	5,314.0	5,314.0	0.0
AA	10,232	22	60	9.3	5,329.6	5,329.6	5,329.6	0.0

[1]Feet Above Mouth

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF RANGELY, CO
(RIO BLANCO CO.)

FLOODWAY DATA

COLLEGE CANYON DRAW (CONT'D)

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 500-year floodplain, areas within 500-year floodplain, areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols, the 100- and 500-year floodplains, the floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

7.0 OTHER STUDIES

A Flood Insurance Study had been prepared for the Town of Rangely in 1977 (Reference 13). This study was revised in 1982 to include new annexations (Reference 14). The hydrologic analyses in the 1977 study, which dealt with the White River, compared well with peak flows determined for the 1982 study and the flows determined by Claycomb Engineers, as outlined in Hydrologic Methods for Storm Drainage Master Plan of Rangely, dated November 1982 (Reference 7).

A study of flooding for the White River, College Canyon Draw, and Coal Mine Draw near the Town of Rangely was performed by Simons, Li & Associates, Inc., for the Town of Rangely (Reference 1). This study used more detailed analyses for the White River and therefore superseded the 1982 study for the Town of Rangely.

The current revised study for the Town of Rangely was initiated because of new corporate limit annexations. The flood hazard information for this restudy was taken directly from the Rio Blanco County study (Reference 15). That current study is, therefore, in agreement with the Rio Blanco County study.

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this Flood Insurance Study can be obtained by contacting the Chief, Natural and Technological Hazards Division, FEMA, Building 710, Box 25267, Denver, Colorado 80225-0267.

9.0 BIBLIOGRAPHY AND REFERENCES

1. Federal Emergency Management Agency, Flood Insurance Study, Town of Rangely, Rio Blanco County, Colorado, September 27, 1985.

2. Town of Rangely, Colorado, community profile, 1988.

3. Colorado Water Conservation Board, "Technical Manual No. 1, Manual for Estimating Flood Characteristics of Natural Flow Streams in Colorado," 1976.

4. U.S. Department of the Interior, Geological Survey, WSP 1683, "Magnitude and Frequency of Floods in the United States, Part 9, Colorado River Basin," 1966.

5. U.S. Department of Interior, Geological Survey, Open-File Report 82-426, Annual Snowmelt and Rainfall Peak-Flow Data on Selected Foothills Region Streams, South Platte River, Arkansas River and Colorado River Basins, Colorado, 1982.

6. Simons, Li & Associates, Inc., Hydrology Report for Town of Rangely, City of Rifle and Garfield County Flood Insurance Studies, 1983.

7. Claycomb Engineers, Correspondence, Hydrologic Methods for Storm Drainage Master Plan of Rangely, November 1982.

8. U.S. Department of Agriculture, Soil Conservation Service, Use of Storm and Watershed Characteristics in Synthetic Hydrograph Analysis and Application, 1957.

9. U.S. Department of the Army, Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water Surface Profiles Users Manual, September 1982.

10. Bell Mapping Company, Aerial Photography, Scale 1:4,800, Denver, Colorado, May 27, 1982.

11. Bell Mapping Company, Topographic Mapping, Scale 1:1,200, Contour Interval 2 feet, Denver, Colorado, 1982.

12. Merrick and Company, Topographic Map, Scale 1:2,400, Contour Interval 2 feet, Rangely, Colorado 1975.

13. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, Town of Rangely, Rio Blanco County, Colorado, February, 1977.

14. Federal Emergency Management Agency, Flood Insurance Rate Map, Town of Rangely, Rio Blanco County, Colorado, December 1977, revised December 1982.

15. Federal Emergency Management Agency, Flood Insurance Study, Rio Blanco County, Colorado, unincorporated areas, February 16, 1990.

U.S. Department of the Interior, Geological Survey, 7.5-Minute Series Topographic Maps, Scale 1:24,999, Contour Interval 40 feet, Rangely NE, Colorado, 1962; Cactus Reservoir, Colorado, 1962; Rangely, Colorado, 1962; Gillam Draw, Colorado, 1962.

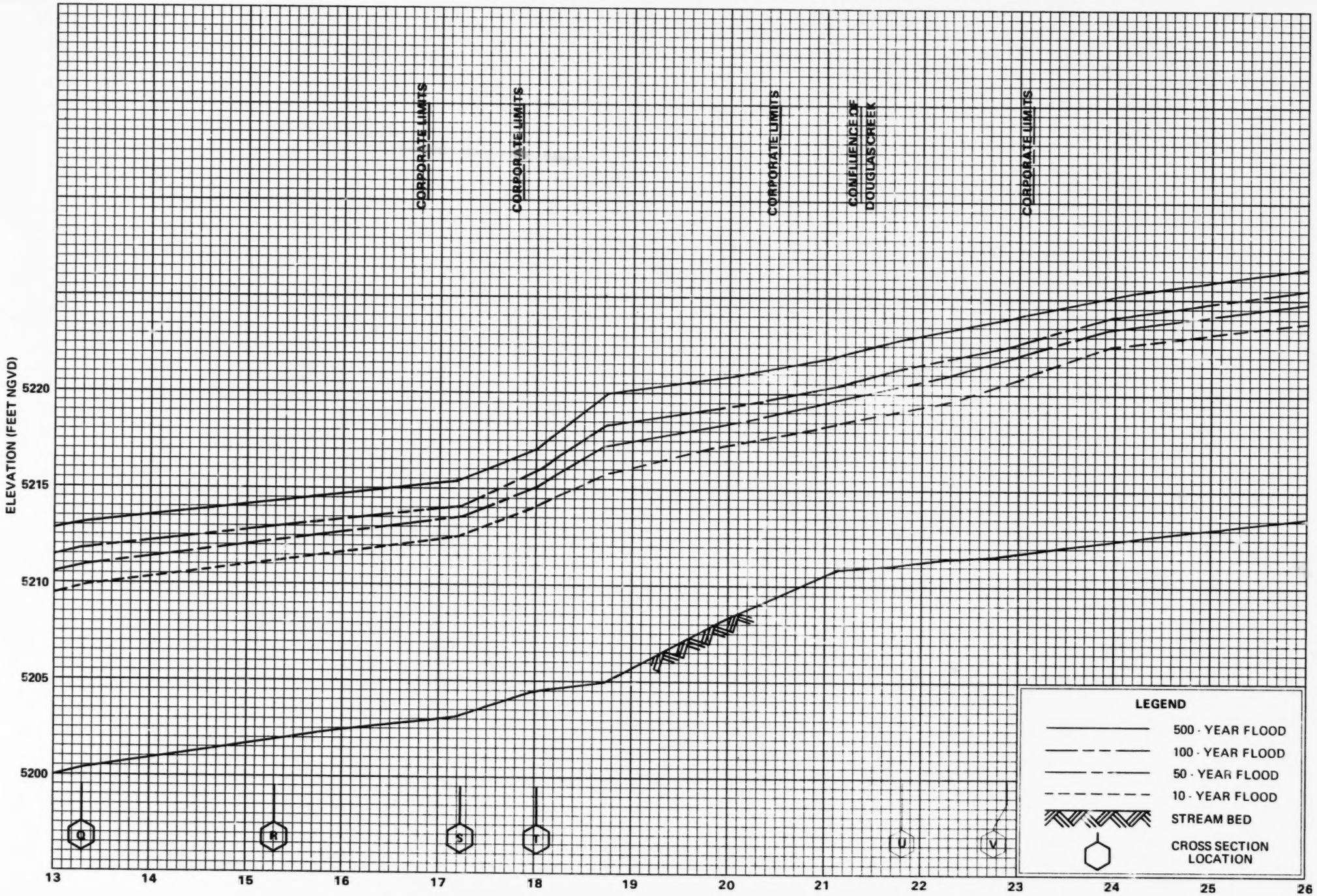
FLOOD PROFILES

WHITE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF RANGELY, CO
(RIO BLANCO CO.)

01P



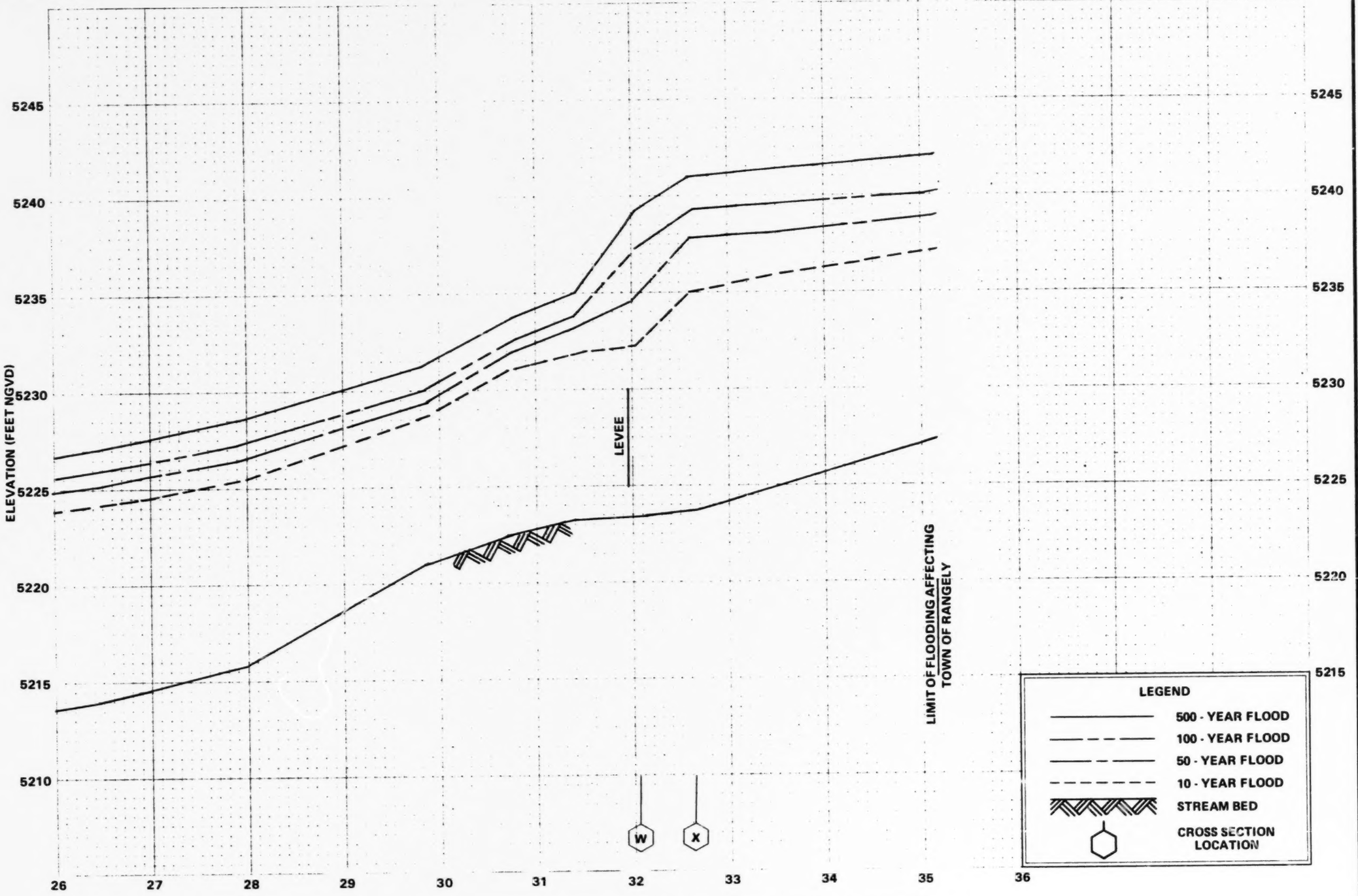
FLOOD PROFILES

WHITE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF RANGELY, CO
(RIO BLANCO CO.)

02P



FLOOD PROFILES

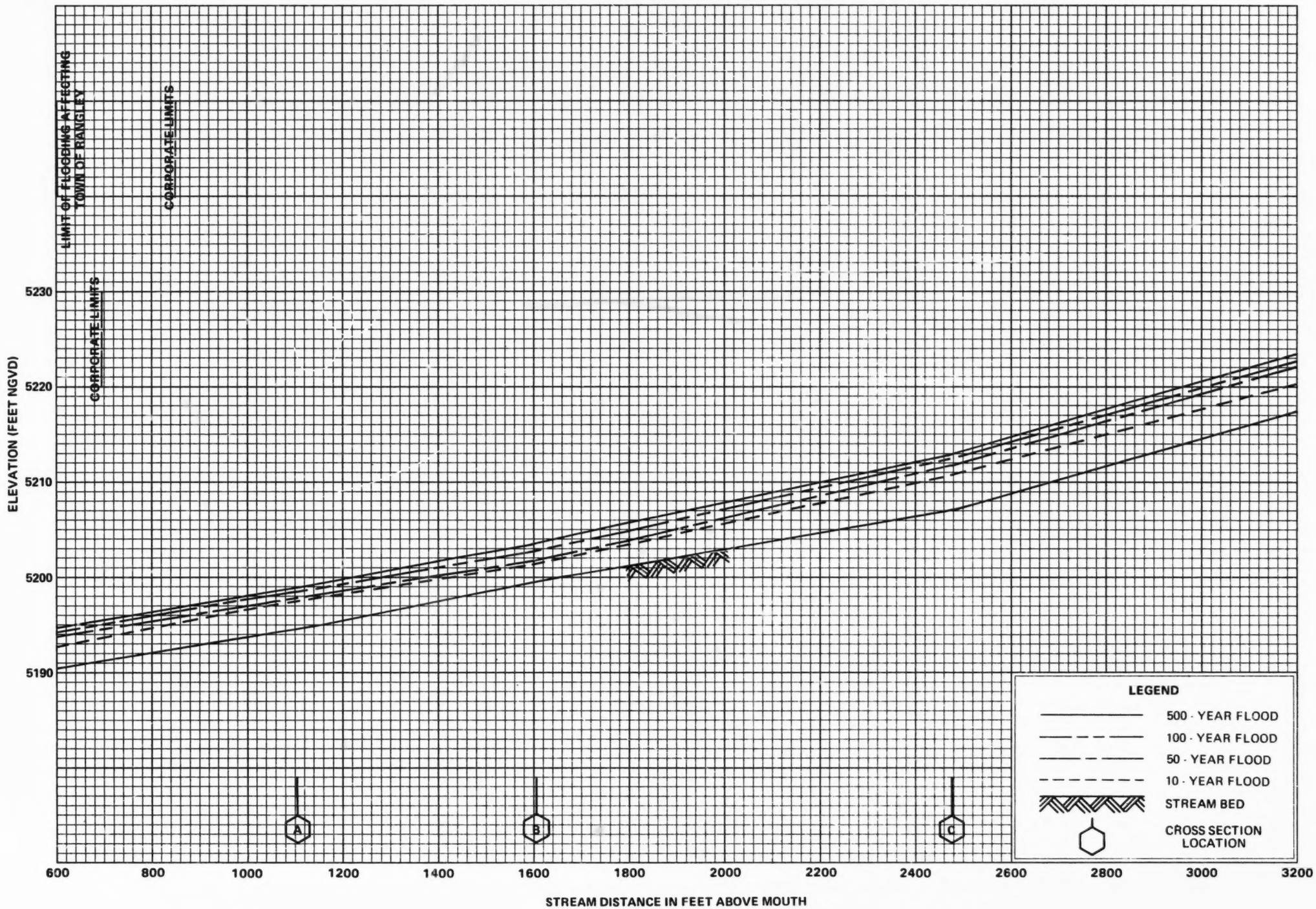
WHITE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF RANGELY, CO
(RIO BLANCO CO.)

03P

a1



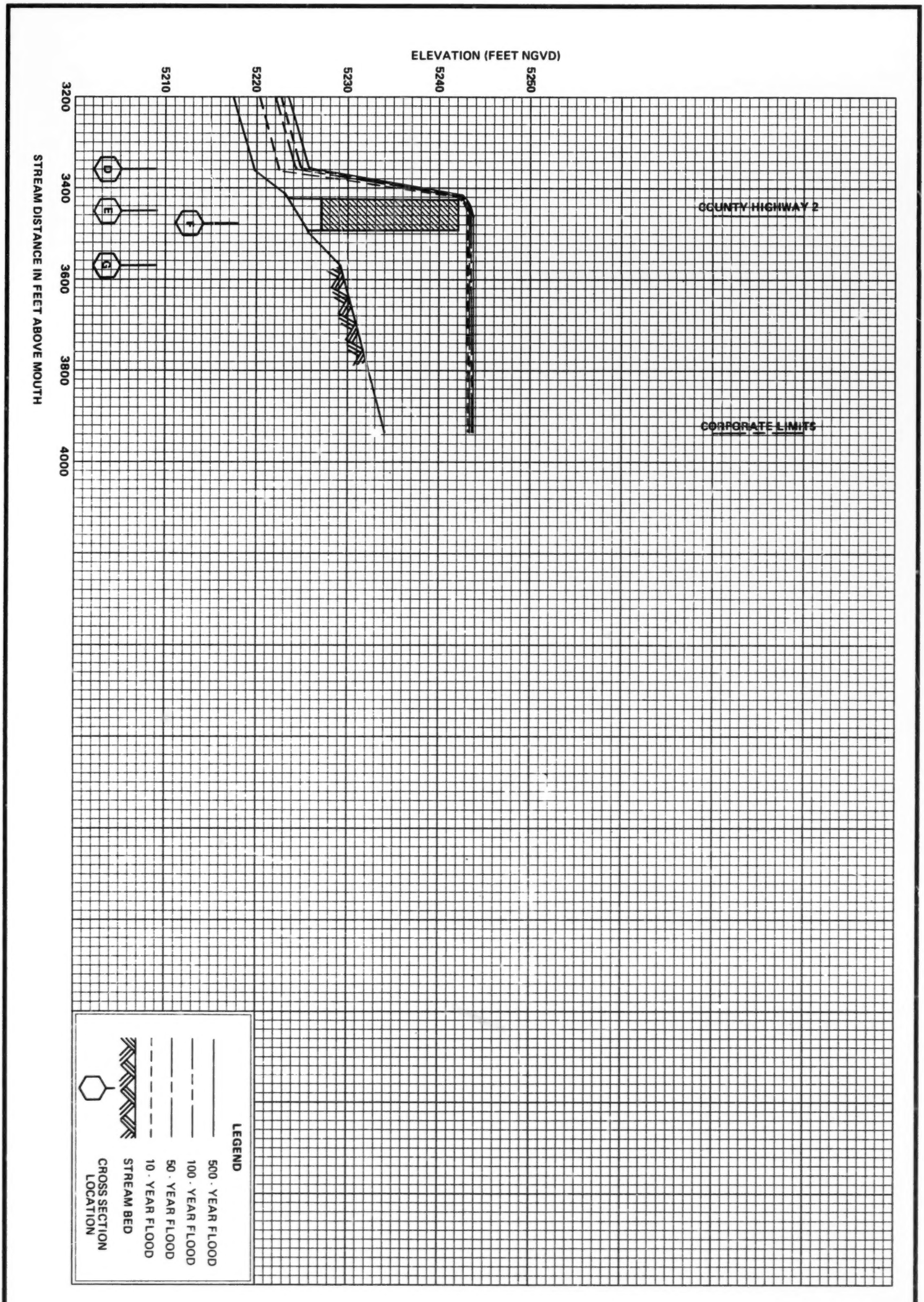
FLOOD PROFILES

COAL MINE DRAW

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF RANGELY, CO
(RIO BLANCO CO.)

04P



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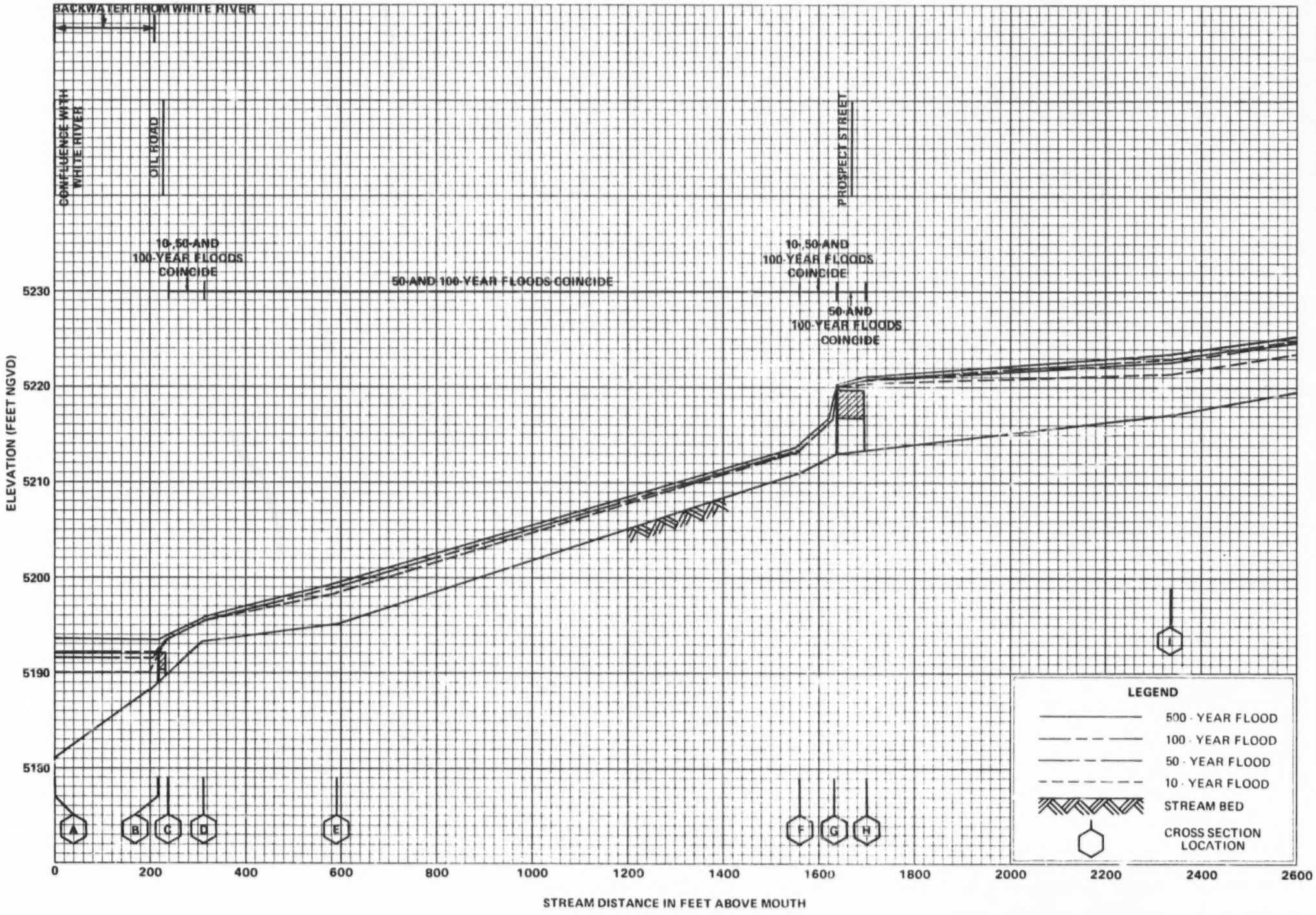
05P

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF RANGELY, CO
(RIO BLANCO CO.)

FLOOD PROFILES

COAL MINE DRAW



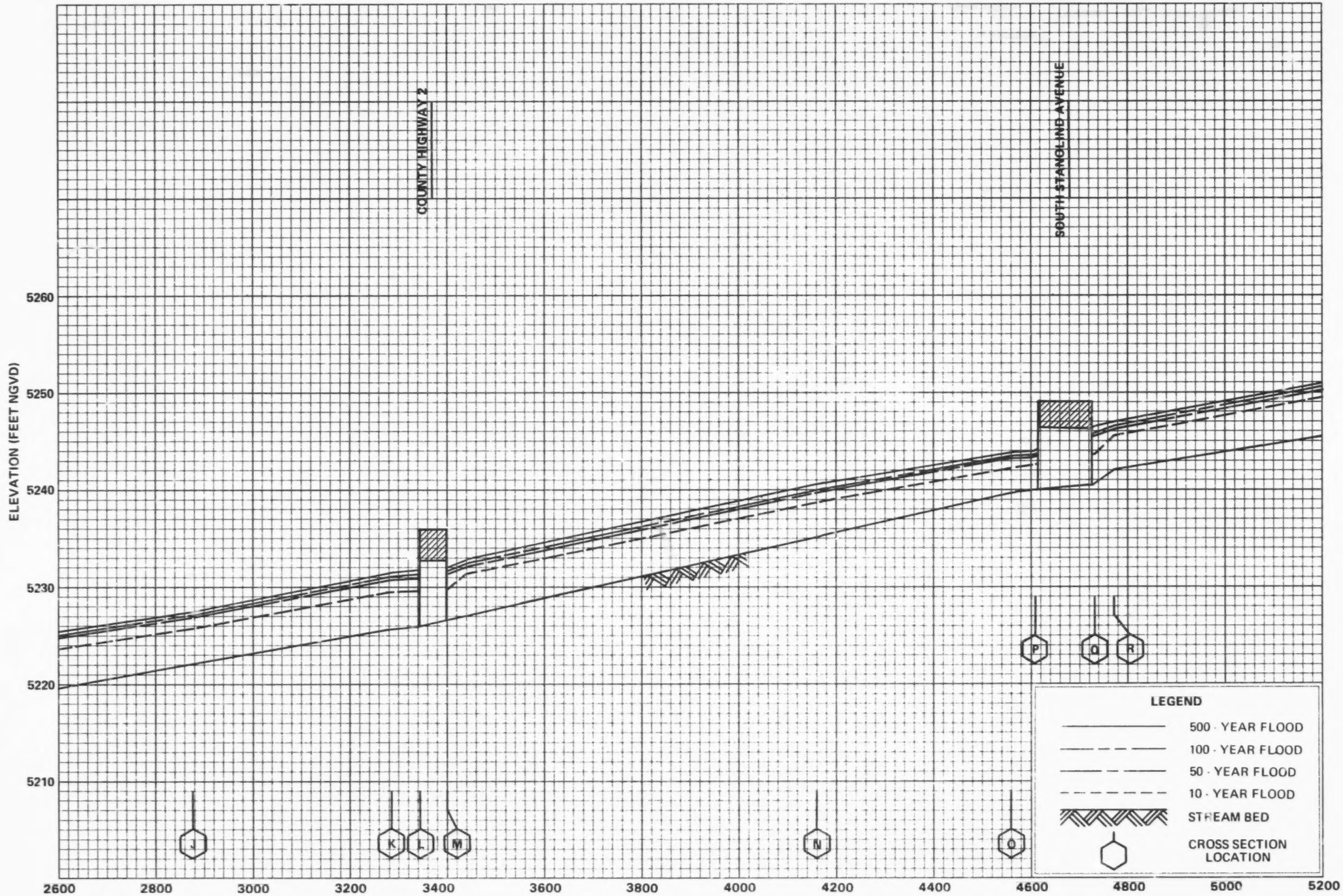
FLOOD PROFILES

COLLEGE CANYON DRAW

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF RANGELY, CO
(RIO BLANCO CO.)

06P



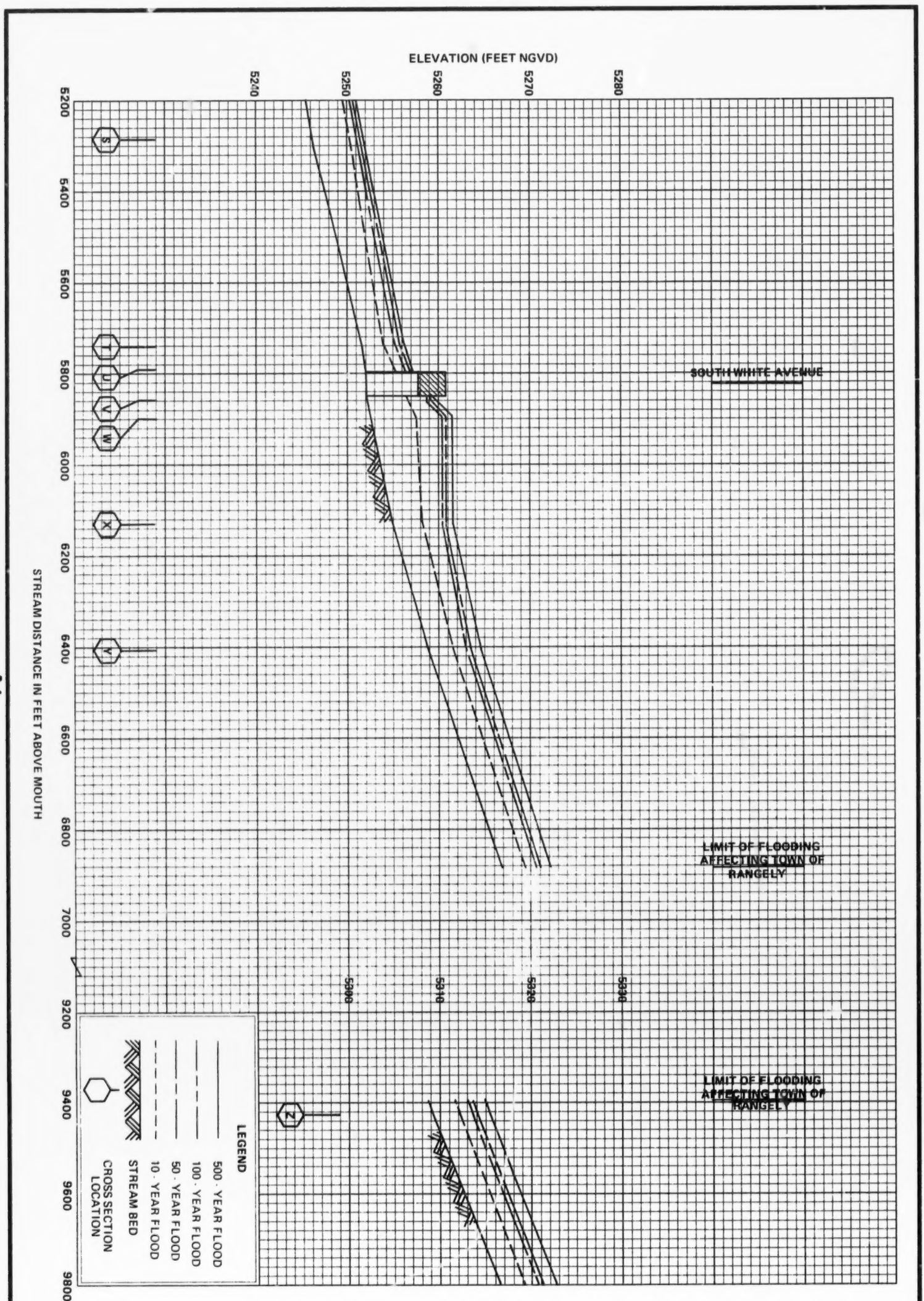
FLOOD PROFILES

COLLEGE CANYON DRAW

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF RANGELY, CO
(RIO BLANCO CO.)

07P



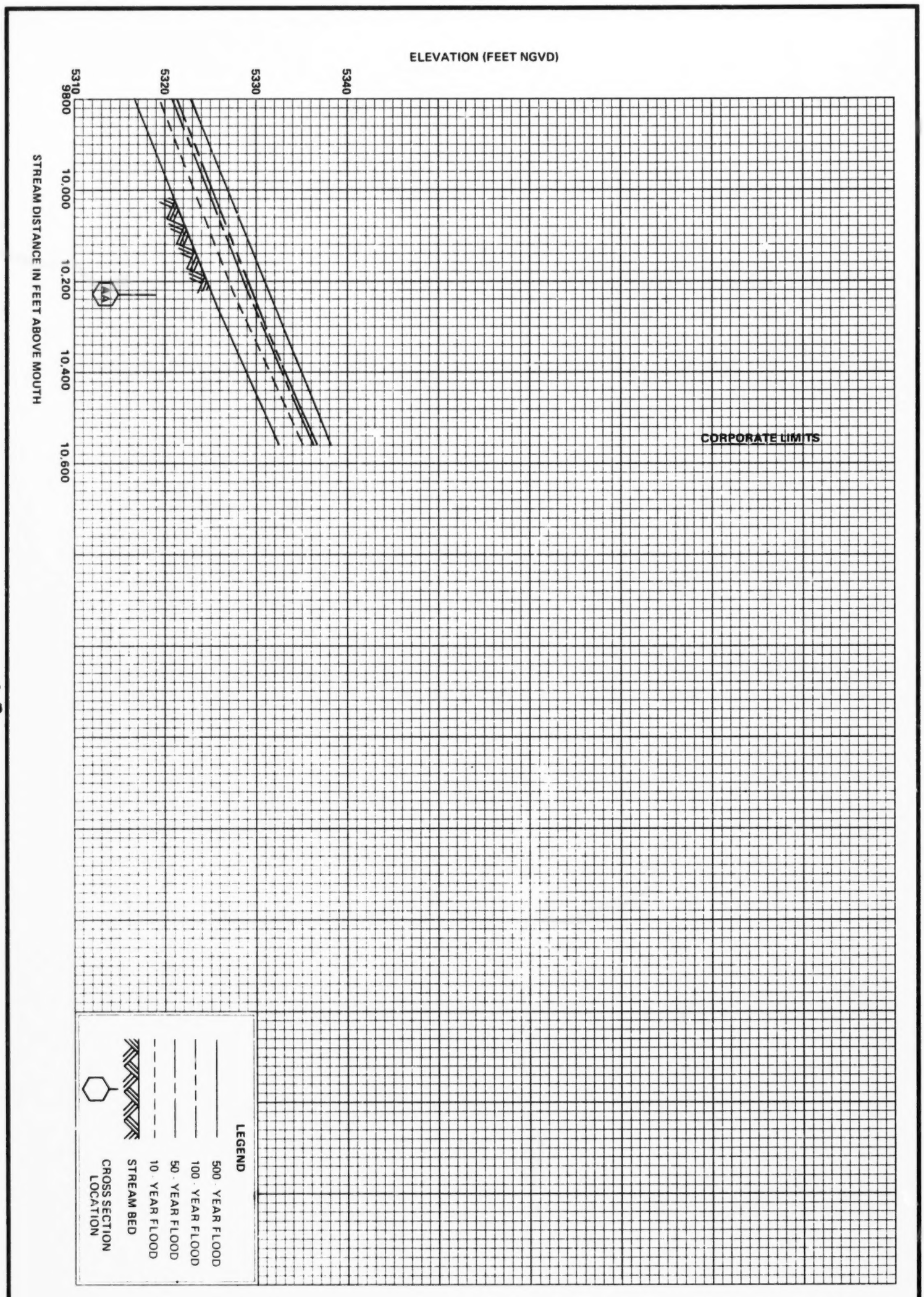
08P

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWN OF RANGELY, CO
(RIO BLANCO CO.)

FLOOD PROFILES

COLLEGE CANYON DRAW



09P	FEDERAL EMERGENCY MANAGEMENT AGENCY TOWN OF RANGELY, CO (RIO BLANCO CO.)	**FLOOD PROFILES** COLLEGE CANYON DRAW

EXHIBIT 3 - ELEVATION REFERENCE MARKS

Elevation Reference Mark	FIRM Panel	Elevation (feet NGVD)	Description of Location
RM 1	0001	5198.068	Brass cap, stamped "19 RMH RESET 1969," on top of the southeast endpost of the State Highway 64 bridge over White River, 1.2 miles northwest of the Rangely post office.
RM 2	0001	5212.400	A No. 60 bridge spike, inscribed "UE," in paint at the intersection of Main Street and Birch Avenue, at the north side of Main Street on the centerline of Birch Avenue.
RM 3	0001	5261.161	A standard U.S. Coast and Geodetic Survey disk, stamped "K 151 1934," in the top of a concrete post, 0.5 mile east of the Rangely post office along State Highway 64.